

FORM PTO-1390 (Modified) (REV 11-2000)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER <b>220245US0PCT</b>
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371			U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR <b>10/088900</b>
INTERNATIONAL APPLICATION NO. <b>PCT/EP00/09022</b>	INTERNATIONAL FILING DATE <b>15 September 2000</b>	PRIORITY DATE CLAIMED <b>30 September 1999</b>	
TITLE OF INVENTION <b>ADHESIVES FOR REFRIGERATED SUBSTRATES</b>			
APPLICANT(S) FOR DO/EO/US <b>Bernd MEYER-ROSCHE et al.</b>			
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:			
<ol style="list-style-type: none"> <li>1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a filing under 35 U.S.C. 371.</li> <li>2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a filing under 35 U.S.C. 371.</li> <li>3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (24) indicated below.</li> <li>4. <input checked="" type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (Article 31).</li> <li>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371 (c) (2)) <ol style="list-style-type: none"> <li>a. <input type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau).</li> <li>b. <input checked="" type="checkbox"/> has been communicated by the International Bureau.</li> <li>c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).</li> </ol> </li> <li>6. <input checked="" type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)). <ol style="list-style-type: none"> <li>a. <input checked="" type="checkbox"/> is attached hereto.</li> <li>b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4).</li> </ol> </li> <li>7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3)) <ol style="list-style-type: none"> <li>a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau).</li> <li>b. <input type="checkbox"/> have been communicated by the International Bureau.</li> <li>c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</li> <li>d. <input checked="" type="checkbox"/> have not been made and will not be made.</li> </ol> </li> <li>8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</li> <li>9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).</li> <li>10. <input type="checkbox"/> An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).</li> <li>11. <input type="checkbox"/> A copy of the International Preliminary Examination Report (PCT/IPEA/409).</li> <li>12. <input checked="" type="checkbox"/> A copy of the International Search Report (PCT/ISA/210).</li> </ol>			
<b>Items 13 to 20 below concern document(s) or information included:</b>			
<ol style="list-style-type: none"> <li>13. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.</li> <li>14. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</li> <li>15. <input checked="" type="checkbox"/> A <b>FIRST</b> preliminary amendment.</li> <li>16. <input type="checkbox"/> A <b>SECOND</b> or <b>SUBSEQUENT</b> preliminary amendment.</li> <li>17. <input type="checkbox"/> A substitute specification.</li> <li>18. <input type="checkbox"/> A change of power of attorney and/or address letter.</li> <li>19. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.</li> <li>20. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4).</li> <li>21. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).</li> <li>22. <input type="checkbox"/> Certificate of Mailing by Express Mail</li> <li>23. <input checked="" type="checkbox"/> Other items or information:</li> </ol>			
<b>Notice of Priority/ Form PTO-1449</b> <b>PCT/IB/304/ PCT/IB/308</b>			

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 1.101) <b>30/388900</b>		INTERNATIONAL APPLICATION NO.		ATTORNEY'S DOCKET NUMBER	
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24. The following fees are submitted: <b>BASIC NATIONAL FEE ( 37 CFR 1.492 (a) (1) - (5)) :</b>				<b>CALCULATIONS PTO USE ONLY</b>	
<input type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO ..... <b>\$1040.00</b>					
<input checked="" type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... <b>\$890.00</b>					
<input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... <b>\$740.00</b>					
<input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... <b>\$710.00</b>					
<input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) ..... <b>\$100.00</b>					
<b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b>				<b>\$890.00</b>	
Surcharge of <b>\$130.00</b> for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).				<b>\$0.00</b>	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	15 - 20 =	0	x \$18.00	<b>\$0.00</b>	
Independent claims	2 - 3 =	0	x \$84.00	<b>\$0.00</b>	
Multiple Dependent Claims (check if applicable). <input type="checkbox"/>				<b>\$0.00</b>	
<b>TOTAL OF ABOVE CALCULATIONS =</b>				<b>\$890.00</b>	
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27). The fees indicated above are reduced by 1/2.				<b>\$0.00</b>	
<b>SUBTOTAL =</b>				<b>\$890.00</b>	
Processing fee of <b>\$130.00</b> for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).				<b>\$0.00</b>	
<b>TOTAL NATIONAL FEE =</b>				<b>\$890.00</b>	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). <input type="checkbox"/>				<b>\$0.00</b>	
<b>TOTAL FEES ENCLOSED =</b>				<b>\$890.00</b>	
				<b>Amount to be: refunded</b>	\$
				<b>charged</b>	\$


a.	<input checked="" type="checkbox"/>	A check in the amount of <u>      \$890.00      </u> to cover the above fees is enclosed.
b.	<input type="checkbox"/>	Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees. A duplicate copy of this sheet is enclosed.
c.	<input checked="" type="checkbox"/>	The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>      15-0030      </u> . A duplicate copy of this sheet is enclosed.
d.	<input type="checkbox"/>	Fees are to be charged to a credit card. <b>WARNING:</b> Information on this form may become public. <b>Credit card information should not be included on this form.</b> Provide credit card information and authorization on PTO-2038.

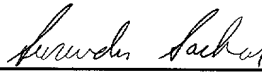
**NOTE:** Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

**Surinder Sachar**  
Registration No. 34,423

**22850**

  
 SIGNATURE

**Norman F. Oblon**  
 NAME

**24,618**  
 REGISTRATION NUMBER

March 25 2002  
 DATE

#4/a

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: ATTN: APPLICATION DIVISION

⋮

: EXAMINER:

said polymer comprises at least 50 wt.% of at least one C<sub>2</sub>-C<sub>18</sub> alkyl(meth)acrylate and from 0.1-30 wt.% of a polymerized monomer A,

wherein said monomer A does not contain carboxylic acid or carboxylic anhydride groups and has a water solubility of more than 5 grams monomer per liter of water, and said substrate is a moist substrate.

11. (New) The process as claimed in Claim 10 wherein the substrate is a refrigerated substrate.

12. (New) The process of Claim 10, wherein said polymer comprises from 50-99.85 wt.% of at least one C<sub>2</sub>-C<sub>18</sub> alkyl(meth)acrylate and from 0.05-10 wt.% of at least one ethylenically unsaturated compound, wherein said ethylenically unsaturated compound has a photoinitiator group.

13. (New) The process as claimed in Claim 11 wherein the ethylenically unsaturated compound is an acetophenone or a benzophenone.

14. (New) The process of Claim 10, wherein the polymer has a K value of from 30-80 measured in 1% strength by weight solution of the polymer in tetrahydrofuran at 21 °C.

15. (New) The process of Claim 10, wherein the polymer has a glass transition temperature of from -60 to +10°C.

16. (New) The process of Claim 10, wherein the monomer A is selected from the group consisting of a hydroxyalkyl (meth)acrylate, methyl (meth)acrylate, (meth)acrylonitrile, (meth)acrylamide and mixtures thereof.

17. (New) The process as claimed in Claim 10 wherein the polymer is a melt.

18. (New) The process of Claim 10, wherein the carrier is first coated with the polymer to form a polymer coated carrier, then the polymer is cross linked by high-energy radiation, then the polymer coated carrier is bonded to a moist substrate.

19. (New) The process of Claim 18, wherein the carrier is a label, adhesive tape or sheet.

20. (New) The process of Claim 18 wherein the high-energy radiation is UV light.

21. (New) The process of Claim 18 wherein the substrate is a refrigerated substrate.

22. (New) A method of applying a carrier to a moist substrate, said method comprising

applying a free radically polymerized, UV cross-linkable polymer to said carrier,

removing a solvent or water, then

cross linking said polymer by high energy radiation, then

bonding the carrier, coated with a polymer to a moist substrate,

wherein said polymer is in a melted form, a solution or an aqueous dispersion,

said polymer is a free radically polymerized, UV cross-linkable addition polymer,

said polymer comprises at least 50 wt.% of at least one C<sub>2</sub>-C<sub>18</sub> alkyl(meth)acrylate

and from 0.1-30 wt.% of a polymerized monomer A, and

wherein said monomer A does not contain carboxylic acid or carboxylic anhydride groups and has a water solubility of more than 5 grams monomer per liter of water.

23. (New) The method of Claim 22 wherein the substrate is a refrigerated substrate.

24. (New) The method of Claim 22 wherein the carrier is a label, adhesive tape or sheet.

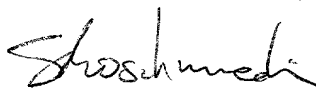
REMARKS

Claims 10-24 are active in the present application. Claims 1-9 have been cancelled.

Claims 10-24 are new claims. Support for the new claims is found in the original claims. No new matter is believed to have been added by this amendment. An action on the merits and allowance of claims is solicited.

Respectfully submitted,

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<b>Marked-Up Copy</b> Serial No: _____ Amendment Filed on: <u>3-25-2002</u>
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IN THE CLAIMS

Claims 1-9 (Cancelled).

Claims 10-24 (New).

# Adhesives for refrigerated substrates

The invention relates to the use of free-radically polymerized, UV-crosslinkable addition polymers which consist to the extent of at least 50% by weight of C<sub>2</sub> to C<sub>18</sub> alkyl (meth)acrylates as adhesives for the bonding of carriers coated with the polymer on substrates, wherein from 0.1 to 30% by weight of the monomers of which said polymer is composed are monomers A without carboxylic acid or carboxylic anhydride groups and with a water solubility of more than 5 g of monomers per liter of water and said substrates are moist substrates, especially refrigerated substrates.

UV-crosslinkable polymers and their use as adhesives - as hot-melt pressure-sensitive adhesives, for example - are known from DE-A-2 411 169, EP-A-246 848, DE-A-4 037 079 or DE-A-3 844 444, for example.

These adhesives have not been used to date for moist substrates, especially refrigerated substrates.

For producing labels for refrigerated product it is normal to use block polymers of the styrene-isoprene-styrene or styrene-butadiene-styrene type. A general disadvantage of these block copolymers lies in their softness, which leads to difficulties in the course of processing and use.

There is a desire for alternative polymers as adhesives for moist, refrigerated substrates.

It is an object of the present invention to provide alternative polymers for such a use.

We have found that this object is achieved by the use defined at the outset.

For crosslinking with UV light, the addition polymer may contain a photoinitiator. The photoinitiator may be attached to the polymer but may also be unattached and merely mixed with the polymer.

Customary photoinitiators that can be added to the polymer are, for example, acetophenone, benzoin ethers, benzil dialkyl ketals, or derivatives thereof.



The amount of photoinitiator mixed in is preferably from 0.05 to 10 parts by weight, with particular preference from 0.1 to 2 parts by weight, per 100 parts by weight of polymer.

- 5 Through irradiation with high-energy light, especially UV light, the photoinitiator or photoinitiator group brings about a crosslinking of the polymer, preferably by means of a chemical grafting reaction of the photoinitiator group with a spatially adjacent polymer chain. Crosslinking can be effected in particular by inserting a carbonyl group of the photoinitiator into an adjacent C-H bond to form a -C-C-O-H grouping.

- 15 The wavelength range within which the photoinitiator group can be activated, i.e., that in which the principal absorption band of the photoinitiator group lies, is preferably from 200 to 450 nm, with particular preference from 250 to 350 nm, with very particular preference from 250 to 280 nm.

Preferably, the photoinitiator is attached to the polymer.

20

The polymer is obtainable by free-radical addition polymerization from ethylenically unsaturated free-radically polymerizable compounds.

- 25 In the preferred case where the photoinitiator is attached to the polymer an ethylenically unsaturated compound having a photoinitiator group is preferably incorporated by copolymerization.
- 30 The UV-crosslinkable polymer consists preferably to the extent of from 50 to 99.85% by weight, preferably from 60 to 99.4% by weight, with very particular preference from 80 to 98.9% by weight, of C<sub>2</sub> to C<sub>18</sub> alkyl (meth)acrylates. Preference is given to C<sub>2</sub>-C<sub>10</sub> alkyl (meth)acrylates, e.g., n-butyl acrylate, ethyl acrylate, and 2-ethylhexyl acrylate. Mixtures of the alkyl (meth)acrylates are used in particular.

- 35 In the case of the copolymerized photoinitiator the addition polymer further consists to the extent of from 0.05 to 10% by weight, preferably from 0.1 to 2% by weight and with particular preference, from 0.1 to 1% by weight, of ethylenically unsaturated compounds having a photoinitiator group.

- 40 The ethylenically unsaturated compound having a photoinitiator group is preferably an acetophenone derivative or, with particular preference, a benzophenone derivative.

45

## 3

Suitable compounds are acetophenone or benzophenone derivatives containing at least one - preferably one - ethylenically unsaturated group. The ethylenically unsaturated group is preferably an acrylic or methacrylic group.

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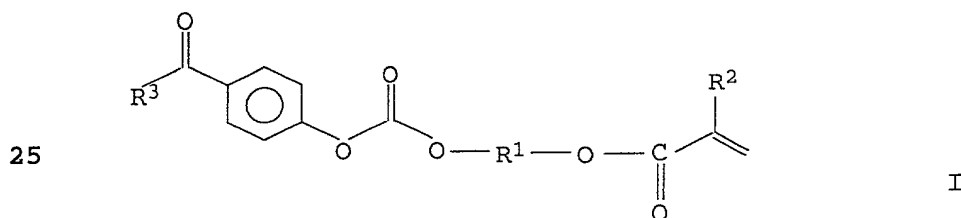
The ethylenically unsaturated group can be attached directly to the phenyl ring of the acetophenone or benzophenone derivative. In general, there is a spacer group situated between phenyl ring and ethylenically unsaturated group.

10

The spacer group can contain, for example, up to 100 carbon atoms.

Suitable acetophenone or benzophenone derivatives are described, for example, in EP-A-346 734, EP-A-377199 (1<sup>st</sup> claim), DE-A-4 037 079 (1<sup>st</sup> claim) and DE-A-3 844 444 (1<sup>st</sup> claim) and are incorporated by this reference into the present specification. Preferred acetophenone and benzophenone derivatives are those of the formula

20



where R<sup>1</sup> is an organic radical having up to 30 carbon atoms, R<sup>2</sup> is a hydrogen atom or a methyl group, and R<sup>3</sup> is an unsubstituted or substituted phenyl group or a C<sub>1</sub>-C<sub>4</sub> alkyl group.

With particular preference, R<sup>1</sup> is an alkylene group, especially a C<sub>2</sub>-C<sub>8</sub> alkylene group.

35

With particular preference, R<sup>3</sup> is a methyl group or a phenyl group.

The addition polymer may further include ethylenically unsaturated compounds as structural components. Mention may be made, for example, of vinyl esters of carboxylic acids containing up to 20 carbon atoms, vinylaromatics having up to 20 carbon atoms, ethylenically unsaturated nitriles, vinyl halides, vinyl ethers of alcohols containing 1 to 10 carbon atoms, aliphatic hydrocarbons having 2 to 8 carbon atoms and 1 or 2 double bonds, or mixtures of these monomers.

## 4

Examples of vinyl esters of carboxylic acids having 1 to 20 carbon atoms are vinyl laurate, vinyl stearate, vinyl propionate, Versatic acid vinyl esters, and vinyl acetate.

5 Suitable vinylaromatic compounds are vinyltoluene,  $\alpha$ - and p-methylstyrene,  $\alpha$ -butylstyrene, 4-n-butylstyrene, 4-n-decylstyrene and, preferably, styrene. Examples of nitriles are acrylonitrile and methacrylonitrile.

10 The vinyl halides are chloro-, fluoro- or bromo-substituted ethylenically unsaturated compounds, preferably vinyl chloride and vinylidene chloride.

Examples of vinyl ethers are vinyl methyl ether and vinyl isobutyl ether. Preference is given to vinyl ethers of alcohols containing 1 to 4 carbon atoms.

As hydrocarbons having 2 to 8 carbon atoms and two olefinic double bonds mention may be made of butadiene, isoprene, and  
20 chloroprene.

The addition polymer may further include monomers having carboxylic, sulfonic or phosphonic acid groups. Carboxylic acid groups are preferred. Examples that may be mentioned include  
25 acrylic acid, methacrylic acid, itaconic acid, maleic acid, and fumaric acid.

Examples of further monomers include hydroxyl-containing monomers, (meth)acrylamide or phenyloxyethyl glycol  
30 mono(meth)acrylate, glycidyl acrylate, glycidyl methacrylate, and amino (meth)acrylates such as 2-aminoethyl (meth)acrylate.

It is essential that in total from 0.1 to 30% by weight of the ethylenically unsaturated compounds of which the addition polymer  
35 is composed are the monomers A defined at the outset.

The monomers A) do not include monomers having carboxylic acid or carboxylic anhydride groups.

40 Monomers A have a water solubility at 21°C of more than 5 g of monomer per liter (l) of water.

The water solubility is preferably more than 10 g/l of water.

45 Customary acrylic monomers on the other hand, such as C<sub>2</sub>-C<sub>18</sub> alkyl (meth)acrylates, have a water solubility well below 5 g/l.

## 5

Preferred monomers A are selected from the acrylic monomers. Particularly suitable are hydroxyalkyl (meth)acrylates, methyl (meth)acrylate, (meth)acrylonitrile, and (meth)acrylamide.

- 5 Particular preference is given to hydroxyethyl (meth)acrylate, hydroxypropyl (meth)acrylate, methyl (meth)acrylate, (meth)acrylonitrile, and (meth)acrylamide.

- 10 Preferably from 0.5 to 20% by weight, with particular preference from 1 to 12% by weight, of the monomers are monomers A.

The addition polymer preferably has a K value of from 30 to 80, with particular preference from 40 to 60, measured in 1% solution (solvent: tetrahydrofuran, 21°C).

15

The K value according to Fikentscher is a measure of the molecular weight and the viscosity of the polymer.

- 20 The glass transition temperature ( $T_g$ ) of the addition polymer is preferably from -60 to +10°C, with particular preference from -55 to 0°C, with very particular preference from -55 to -20°C.

The glass transition temperature of the addition polymer can be determined by customary methods such as differential

- 25 thermoanalysis or differential scanning calorimetry (see, e.g., ASTM 3418/82, midpoint temperature).

The UV-crosslinkable addition polymers can be prepared by copolymerizing the monomer components using the customary

- 30 polymerization initiators and, if desired, using regulators, polymerization being carried out at the customary temperatures in bulk, in emulsion - for example, in water or liquid hydrocarbons - or in solution. The novel copolymers are preferably prepared by polymerizing the monomers in solvents, especially in solvents  
35 with a boiling range of from 50 to 150°C, preferably from 60 to 120°C, using the customary amounts of polymerization initiators, these amounts being generally from 0.01 to 10% by weight, in particular from 0.1 to 4% by weight, based on the overall weight of the monomers. Suitable solvents include in particular  
40 alcohols, such as methanol, ethanol, n- and isopropanol, n- and isobutanol, preferably isopropanol and/or isobutanol, and also hydrocarbons such as toluene and, in particular, petroleum spirits with a boiling range of from 60 to 120°C. It is also possible to use ketones, such as acetone and methyl ethyl ketone,  
45 and esters, such as ethyl acetate, and also mixtures of such solvents, preference being given to mixtures containing isopropanol and/or isobutanol in amounts of from 5 to 95% by

weight, in particular from 10 to 80% by weight, preferably from 25 to 60% by weight, based on the solvent mixture used.

In the case of solution polymerization, appropriate  
5 polymerization initiators include, for example, azo compounds or ketone peroxides.

Following the polymerization in solution, the solvents can if  
desired be separated off under reduced pressure, operating at  
10 elevated temperatures in the range, for example, of from 100 to 150°C. In this case the polymers can be used in the solvent-free state, i.e., as melts. In many cases it is also of advantage to prepare the novel UV-crosslinkable polymers by polymerization in bulk, i.e., without the use of a solvent, in which case it is  
15 possible to operate batchwise or else continuously, in accordance, for example, with the information in US-A-4,042,768.

The addition polymer can be a melt, a solution in an organic solvent, or an aqueous dispersion and can be used in this form.  
20

The polymers are preferably used in the form of a melt, i.e., in essentially solvent-free form (solvent content preferably less than 2% by weight based on the polymer).

25 The polymer can be applied to carriers, preferably from the melt, by usual techniques, such as brushing, rolling, flow coating, or knife coating, for example. In the case of the solution or aqueous dispersion, the solvent or water is removed, generally by drying.

30 In order to increase the flowability of the polymer, the temperature of the polymer in the case of application as a melt can be from 10 to 150°C, preferably from 50 to 150°C, with particular preference from 100 to 150°C.

35 Preferred film thicknesses are for example from 2 to 50  $\mu\text{m}$ , with particular preference from 5 to 40  $\mu\text{m}$ , with very particular preference from 10 to 30  $\mu\text{m}$ .

40 Suitable carriers include, for example, labels made of paper or plastic, e.g., polyester, polyolefins or PVC, and also adhesive tapes or sheets of the above plastics.

Subsequently, the polymers are crosslinked with high-energy  
45 radiation, preferably UV light.

For this purpose, the coated carriers are generally placed on a conveyor belt and the conveyor belt is guided past a radiation source; for example, a UV lamp.

- 5 The degree of crosslinking of the polymers depends on the intensity and duration of irradiation.

The radiation energy is preferably in total from 100 to 1500 mJ/cm<sup>2</sup> of irradiated surface.

10

The resulting, polymer-coated carriers can be bonded to moist substrates, especially refrigerated substrates. These substrates may, for example, be frozen product packaged with paper or with polymer films.

15

Despite the moisture, and/or a film of water or layer of ice on the substrates, very good adhesion of the coated carriers, e.g., labels, is found.

- 20 The addition polymer is therefore suitable as an adhesive, or pressure-sensitive adhesive, especially hot-melt pressure-sensitive adhesive, for moist substrates, especially refrigerated substrates. In comparison to hot-melt pressure-sensitive adhesives based on

- 25 styrene-butadiene(isoprene)-styrene block copolymers, the addition polymers exhibit a much higher thermal stability and reduced strikethrough, by which is meant the penetration of the adhesive coating to the front face, the generally printed face of the carrier. In the case of paper labels in particular,  
30 strikethrough results in an unwanted visual deterioration.

#### Examples

##### I) Addition polymers

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P1: Acrylic polymer composed of 91% by weight ethylhexyl acrylate and 9% by weight hydroxyethyl acrylate

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C1: Acrylic polymer composed of 100% by weight ethylhexyl acrylate

The polymers were prepared by conventional solution polymerization with subsequent distillative removal of the solvent.

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## II) Preparation of the coated carriers and testing

The polymers P1 and C1 were each coated from the melt onto label paper at a temperature of 120°C. The film thickness was 20 µm.

5

The coated label paper was irradiated with UV light and the polymer was crosslinked.

The label paper was bonded to a polyethylene plate and the force required for peeling, in N/25 mm, was determined using a tensile testing machine.

The experiment was carried out at different temperatures of the polyethylene surface:

15

	+25°C	+5°C	-20°C	-10°C *
P1	4.2	5.8	3.7	3.6
C1	1.9	3.5	3.3	3.0

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\* The polyethylene surface was first wetted so that a coherent film of water formed.

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We claim:

1. The use of free-radically polymerized, UV-crosslinkable addition polymers which consist to the extent of at least 50% by weight of C<sub>2</sub> to C<sub>18</sub> alkyl (meth)acrylates as adhesives for the bonding of carriers coated with the polymer on substrates, wherein from 0.1 to 30% by weight of the monomers of which said polymer is composed are monomers A without carboxylic acid or carboxylic anhydride groups and with a water solubility of more than 5 g of monomers per liter of water and said substrates are moist substrates, especially refrigerated substrates.
2. The use as claimed in claim 1, wherein said polymer consists to the extent of from 50 to 99.85% by weight of C<sub>2</sub> to C<sub>18</sub> alkyl (meth)acrylates and to the extent of from 0.05 to 10% by weight of ethylenically unsaturated compounds having a photoinitiator group.
3. The use as claimed in claim 2, wherein the ethylenically unsaturated compound having a photoinitiator group is an acetophenone derivative or benzophenone derivative.
4. The use as claimed in any of claims 1 to 3, wherein said polymer has a K value of from 30 to 80, measured in 1% strength by weight solution of said polymer in tetrahydrofuran at 21°C.
5. The use as claimed in any of claims 1 to 4, wherein the glass transition temperature of said polymer is from -60 to +10°C.
6. The use as claimed in any of claims 1 to 5, wherein said monomers A comprise hydroxyalkyl (meth)acrylates, methyl (meth)acrylate, (meth)acrylonitrile or (meth)acrylamide.
7. The use as claimed in any of claims 1 to 6, wherein said polymer is applied as a melt.
8. The use as claimed in any of claims 1 to 7, wherein said polymers are applied to carriers, especially labels, adhesive tapes or sheets, subsequently crosslinked by high-energy radiation, especially UV light, and the resulting carriers coated with said polymer are bonded to moist substrates, especially refrigerated substrates.



9. A method of applying carriers, especially labels, adhesive  
tapes or sheets, to moist substrates, especially refrigerated  
substrates, which comprises applying a polymer as set forth  
in any of claims 1 to 6 from the melt, as a solution or as an  
aqueous dispersion to said carriers, in the case of the  
solution or aqueous dispersion removing the solvent or the  
water, subsequently crosslinking said polymer by means of  
high-energy radiation, especially UV light, and bonding the  
resulting carriers, coated with the polymer, to moist  
substrates, especially refrigerated substrates.

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## Hot-melt adhesives for refrigerated substrates

## Abstract

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The use of free-radically polymerized, UV-crosslinkable polymers which consist to the extent of at least 50% by weight of C<sub>2</sub> to C<sub>18</sub> alkyl (meth)acrylates as adhesives for the bonding of carriers coated with the polymer on substrates, wherein from 0.1 to 30% by weight of the monomers of which said polymer is composed are monomers A without carboxylic acid or carboxylic anhydride groups and with a water solubility of more than 5 g of monomers per liter of water and said substrates are moist substrates, especially refrigerated substrates.

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# Declaration and Power of Attorney for Patent Application

## Erklärung für Patentanmeldungen mit Vollmacht

### German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

Dass mein Wohnsitz, meine Postanschrift und meine Staatsangehörigkeit den im nachstehenden nach meinem Namen aufgeführten Angaben entsprechen, dass ich nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprünglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und für den ein Patent für die Erfindung mit folgendem Titel beantragt wird:

#### ADHESIVES FOR REFRIGERATED SUBSTRATES

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wurde angemeldet am \_\_\_\_\_

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Ich bestätige hiermit, dass ich den Inhalt der oben angegebenen Patentanmeldung, einschließlich der Ansprüche, die eventuell durch einen oben erwähnten Zusatzantrag abgeändert wurde, durchgesehen und verstanden habe.

Ich erkenne meine Pflicht zur Offenbarung jeglicher Informationen an, die zur Prüfung der Patentfähigkeit in Einklang mit Titel 37, Code of Federal Regulations, § 1.56 von Belang sind.

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

the specification of which:

☐ is attached hereto

☒ was filed on 15 September 2000

\_\_\_\_\_ as United States Application Number or PCT International Application Number

PCT/EP/00/09022 \_\_\_\_\_ and was amended on \_\_\_\_\_

\_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.



## German Language Declaration

Ich erkläre hiermit, dass alle in der vorliegenden Erklärung von mir gemachten Angaben nach bestem Wissen und Gewissen der Wahrheit entsprechen, und ferner, dass ich diese eidesstattliche Erklärung in Kenntnis dessen ablege, dass wissentlich und vorsätzlich falsche Angaben oder dergleichen gemäß § 1001, Titel 18 des US-Code strafbar sind und mit Geldstrafe und/oder Gefängnis bestraft werden können und dass derartige wissentlich und vorsätzlich falsche Angaben die Rechtswirksamkeit der vorliegenden Patentanmeldung oder eines aufgrund deren erteilten Patentes gefährden können.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: *(list name and registration number)*



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